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AN OUTLINE OF
THE CANADIAN EASTERN ARCTIC
ITS GEOGRAPHY, PEOPLES AND PROBLEMS



BUREAU OF NORTHWEST TERRITORIES AND YUKON AFFAIRS
LANDS, PARKS AND FORESTS BRANCH
OTTAWA

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CANADA

DEPARTMENT OF MINES AND RESOURCES

AN OUTLINE OF THE CANADIAN EASTERN ARCTIC

Its Geography, Peoples and
Problems

by

J. Lewis Robinson

Issued by the

BUREAU OF NORTHWEST TERRITORIES AND YUKON AFFAIRS

LANDS, PARKS AND FORESTS BRANCH

OTTAWA

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TABLE OF CONTENTS

Introduction.....	1
Administration.....	1
Geology.....	2
Topography.....	3
Hydrography.....	6
Climate and Weather.....	8
Ice Conditions.....	10
Natural Resources.....	12
(a) Minerals	12
(b) Flora	14
(c) Wild Life	15
(d) Fur Trade	19
(e) Conservation	19
Human Geography.....	20
(a) White Population	20
(b) Eskimo Population	22
Transportation.....	26
(a) Summer Transportation	26
(b) Winter Transportation	29
(c) All-season Transportation	30
Communication.....	32
Maps and Mapping.....	33
Government.....	33
Summary.....	36

P R E F A C E

This is a summary of information available about the Canadian Eastern Arctic compiled by J. Lewis Robinson, Economic Geographer, Bureau of Northwest Territories and Yukon Affairs. Acknowledgment is made to the various governmental services that co-operated in supplying information from their respective fields. More detailed information may be obtained from the references listed at the end of the text.

Copies of this memorandum may be had on application to the Bureau of Northwest Territories and Yukon Affairs, Lands, Parks and Forests Branch, Department of Mines and Resources, 150 Wellington Street, Ottawa, Canada.

AN OUTLINE OF THE CANADIAN EASTERN ARCTIC

Its Geography, Peoples and Problems

Canada has two Northlands - the East and the West. The two regions are quite distinct and differ greatly in many respects. The problems which are met in opening-up and developing Canada's Western Northland are not the same as those which will be met in the Eastern Arctic. The former has been endowed with resources possible of development; the latter is a barren country which so far has indicated few possibilities and offers many obstacles.

The Eastern Arctic may be defined generally as that part of northeastern Canada lying north of the tree-line, which is served from the Atlantic Ocean and Hudson Bay. It embraces much of the Northwest Territories, including most of the large and numerous Arctic Islands, as well as part of northern Quebec, and contains an area of about 700,000 square miles or 19 per cent of the total area of Canada. The District of Keewatin includes the mainland of Canada west of Hudson Bay and north of the 60th parallel as far west as 102° west longitude. The islands in Hudson and James Bays also lie within Keewatin District. The District of Franklin comprises the remainder of the Arctic Islands as far north as the North Pole, together with Boothia and Melville Peninsulas of the Canadian mainland. The Arctic mainland of northern Quebec, formerly the District of Ungava, also lies within the Eastern Arctic and although its resources are under provincial administration the Eskimo population at present is the responsibility of the Northwest Territories Administration. Within the Eastern Arctic, which is about twice the size of the Province of British Columbia, or about equal to the areas of Quebec and Manitoba combined, live about 150 whites and 6,000 Eskimo, the latter representing four-fifths of the entire Eskimo population of Canada.

The Eastern Arctic is different from any other section of Canada. As a distinct geographic region it has a combination of problems and conditions which are peculiar to this area alone. In discussions relating to present and post-war planning these factors of the natural environment should be known in order to aid intelligent decisions. What has been planned or accomplished in the Western Arctic and Mackenzie Valley, or in other Arctic regions of the world, may facilitate development of the Eastern Arctic, but must be considered in the light of what is known about the natural conditions and problems of the latter area. It is for the purpose of a better understanding of this large area of Canada that the following descriptions and facts are presented.

ADMINISTRATION

The Northwest Territories has a Territorial Government composed of the Commissioner of the Northwest Territories, the Deputy-Commissioner, and five Councillors appointed by the Governor-General-in-Council. (1)

This body has the power to make ordinances for the government of the Territory under instructions from the Governor-General-in-Council or the Minister of Mines and Resources. Such ordinances may deal with matters of direct taxation for revenue, establishment and tenure of territorial offices, maintenance of municipal institutions, prisons, licences, property and civil rights, administration of justice, and in general all matters of local or private nature within the Territories. The seat of government is in Ottawa.

Since the Arctic environment of the northern coast and Arctic islands causes the natives to depend almost wholly on hunting and trapping for a livelihood, one of the important functions of the Northwest Territories Council is to formulate and enforce the game regulations. Such matters as hunting, trapping, and trading licences, open and close seasons, and the setting aside of game sanctuaries and native preserves give careful consideration to the long-term welfare of the resident population. Much of the Eastern Arctic has thus become part of the large Arctic Islands Game Preserve, where trapping without a licence is confined to Eskimos or half-breeds living the lives of Eskimos.

The Royal Canadian Mounted Police have been delegated the responsibility of enforcing law and order within the Northwest Territories. Since the Eskimo are a generally peaceful people, and the white men are few in number and scattered in the Eastern Arctic, there is little violence with which to contend. The police duties are chiefly those of patrolling the area, by dog-team in winter and small schooner in summer. They visit the native camps, assisting them with first aid or limited medical attention, and wherever possible the police are responsible for seeing that relief rations are issued to needy or destitute natives. The officers also report on game conditions, record vital statistics, issue fur export permits, and perform other similar acts of local administration.

GEOLOGY

The foundations of the Eastern Arctic consist of two chief kinds of rock. Most of the area is underlain by Precambrian rocks of the Canadian Shield, which comprises the geologic base of two-thirds of Canada. Sedimentary rocks, ranging in age from Paleozoic to small local areas of Tertiary, form a belt through the Central Arctic islands and include most of the far northern and western Arctic islands. In general, the areas of Precambrian rocks are more rugged and rounded, while sedimentary rocks are inclined to result in level or low-relief topography.

The ancient assemblages of sediments and volcanics which occur amid the predominant granites and gneisses of the Canadian Shield in the Eastern Arctic are similar to those which have yielded rich and abundant minerals in the better explored areas of the southern and western sections of the Shield (2). Since the later sedimentary rocks

were laid down after the last known period of widespread mineralization in Canada, they may be excluded as promising sources of metalliferous deposits. Such rocks, however, may still be considered as possible sources of coal, oil or gas.

Much or all of the Eastern Arctic was glaciated during the last Ice Age which covered most of Canada with ice several thousands of feet thick. This ice sheet had some of its centres and perhaps its main source of origin in the Eastern Arctic. Areas of permanent ice-caps, glaciers or snowfields still cover several large sections of Ellesmere Island, much of Devon and Baffin Islands, and scattered areas along northeast Baffin Island. Such areas are thus excluded from any hopes for present economic development.

When the ice load decreased at the end of the Ice Age, the land slowly began to rise. Ancient beach ridges and terraces, now found as high as 560 feet above the present water level, have recorded this rise for geologists. (3) In areas of rough topography these terraced areas have proven valuable in supplying suitable locations for settlements and air bases. Except in the mountainous areas, most of the present surface which was exposed after the ice melted back is one of subdued glacial topography. Bare, rounded hills of rock are separated by broad, drift-filled valleys. Post glacial frost action has caused disintegration of the exposed rock, covering the surface with loose frost-riven debris.

TOPOGRAPHY

West Coast of Hudson Bay

The region west of Hudson Bay is one of countless lakes and streams. Although there are no extensive areas of high relief, local rugged sections are to be found. In general the region consists of an interior plateau area where altitudes average about 1,000 feet, and an emerging coastal plain, covered by glacial drift, which slopes towards Hudson Bay and the Arctic Coast. (4) The rolling plateau surface is marked by linear rock ridges which give it a furrowed appearance. Long narrow lakes often occupy the intervening valleys.

The plain along the west coast is about 50 miles wide at Churchill and broadens northward to extend as far inland as Yathkyed and Baker Lakes. North of Chesterfield Inlet the country is more rugged, but gradually slopes down towards the broad, sandy valley of the Back River to the west, and on the east, to a low, monotonous coast along Roes Welcome Sound. Melville Peninsula is a plateau area with a steep-sided west coast and a shelving, terraced area along the central and northern sections of the east coast. In winter, travel is fairly easy by dog team across the frozen, snow-covered surface of the low areas west of Hudson Bay, but in summer the myriads of lakes, swamps, and intervening spongy muskeg confine travel chiefly to the main rivers.

The permanently frozen ground of the Eastern Arctic prevents underground drainage, so that lakes collect in low areas and spill uncertainly from one to another.

This and the disruptive effects of glaciation on drainage have combined to cause a poorly integrated drainage system. The three major rivers, Kazan, Dubawnt, and Thelon, which cut across the inner plateau, (5) flowing north-eastward at right angles to a general alignment of the bare, rocky ridges, finally empty into Baker Lake. All three rivers broaden out into lakes at several places along their courses. These rivers have been the routes of early explorations, and are fairly well mapped, but actually from the air they may be very difficult to pick out from the numerous un-mapped lakes and rivers which surround them.

Islands of Northern Hudson Bay

Southampton Island has two distinct physiographic regions. (6) The larger part, southwest of a line drawn roughly from Duke of York Bay in the north to South Bay and Seahorse Point, is low, flat limestone country. Sloping terraces, which mark ancient beach lines, are the chief topographic features. Along the northeastern part of the Island rugged Precambrian hills rise abruptly above the limestone plain to altitudes of 1,000 to 1,500 feet.

Coats and Mansel Islands are composed chiefly of limestone and have flat or gently-rolling surfaces. Local high areas do not exceed 500 feet in altitude. Nottingham and Salisbury Islands, at the western end of Hudson Strait, are part of the Precambrian complex. Their bare, rocky indented coasts rise abruptly from the water, and when seen from a distance present a level, peneplain surface with an altitude of a few hundred feet. Although the rock surface of these two islands is rounded, the local surface has a rugged character imparted by many valleys and rock ridges.

Northern Quebec

Ungava Peninsula of northern Quebec is a rolling plateau area of low, rocky hills of Precambrian age, dotted with innumerable lakes and drained by many streams. In general the plateau rises fairly abruptly to altitudes of 1,000 to 2,000 feet along the Hudson Bay and Hudson Strait coast, on the west and north, and slopes gradually down towards Ungava Bay on the northeast, forming a horseshoe-shaped upland around this Bay. The interior surface is composed mainly of rolling, bare, rocky hills separated by broad valleys containing lakes and glacial fills of boulders and gravel (7).

Except for routes along a few major streams, the drainage of Ungava has not been mapped, so that very little is known about the accessibility of the interior by water. Most of the large, mapped rivers are very broad as they flow toward Ungava Bay and serve as excellent land-marks from the air. They are well-known and useful routes to the Eskimo who follow the streams inland to hunt.

Baffin Island

Baffin Island is the largest of the Canadian Arctic Islands. Its

area of 200,000 square miles is about equal to the size of the Province of Manitoba. In such a vast area a variety of topographic features are found, and some of them present the most spectacular scenery of Eastern Canada. Along the eastern coast of the Island, from Cumberland Sound on the south, to Lancaster Sound on the north, and including Blyot Island, a high, rugged mountain range of Precambrian age rises to altitudes of about 10,000 feet in places, and averages 5,000 to 7,000 feet. These mountains are therefore, along with those of northern Ellesmere Island, (8) the highest ranges in Eastern North America. Jagged peaks and serrated ridges are partially buried under permanent snowfields and ice caps in some areas. Long, twisting glaciers fill many valleys and discharge into the sea at several places. The whole coast, with its undulations and fiords, rises abruptly from the water, presenting a formidable barrier of rugged grandeur toward Davis Strait and Baffin Bay.

Southern Baffin Island has a drab, rounded coast of bare rock which rises to an altitude of about 1,000 feet (9). A belt of numerous small islands fronts the central part of the south coast. Most of the interior is a rolling plateau area, averaging 2,000 to 3,000 feet in elevation. Its generally bare surface is similar to that of northern Quebec on the southern side of Hudson Strait, but in one place between Frobisher Bay and the south coast it has a small divided ice cap. This upland area slopes down to the north and west to a broad tundra plain which covers the area west of Amadjuak and Nettilling Lakes and extends along the Foxe Basin coast as far northward as the Hantzsch River. (10) The lake-dotted and swampy plain there is somewhat similar in appearance to the tundra area along the west coast of Hudson Bay.

Northwestern Baffin Island is a plateau area underlain by sedimentary rocks of Paleozoic Age and surfaced by disintegrated slabs. The plateau itself is rolling, but the coasts along Admiralty and Prince Regent Inlets are vertical walls of stratified rock, rising to altitudes of 500 to 1,000 feet. Local lowland areas are found along the rivers which are used as routes for overland travel north of Fury and Hecla Strait. (11) Most of Somerset Island, on the western side of Prince Regent Inlet, is a similar sedimentary plateau area.

Northern Arctic Islands

Devon and Ellesmere Islands are the largest of the most northern group of Arctic Islands. Ellesmere Island alone is almost as large as England and Scotland. Both islands have steep rocky eastern coasts. (12) Part of their interiors are covered by extensive ice caps. The sedimentary rock of the western coasts gives a low, rolling area which supplies sufficient vegetation for roaming herds of caribou and musk-ox.

The Parry and Sverdrup groups of islands have a base of sedimentary rock, which has resulted in a generally low or rolling topography. Coasts (13)

are generally shelving terraces or low rounded hills. Large scale topographic features are lacking in the interior, although occasional transverse valleys have been known to hinder winter travel. (14) Few white men, other than R.C.M.P. officers on patrol have seen these areas during the past several decades.

HYDROGRAPHY

Arctic Islands

Including the islands of the Western Arctic, there are 17 major Canadian Arctic Islands over 1,000 square miles in area, about 40 islands larger than 100 square miles and large numbers of smaller ones. The straits, sounds, and channels which separate the Arctic Islands vary in width from a few miles to over 100 miles, with the chief separating bodies of water averaging about 50 miles wide. Between these islands and through the channels the general movement of water is from west to east.

Ocean currents within the basin of the Arctic Ocean move around in a general clockwise direction, passing southward into the Atlantic or Pacific. This water has three chief channels of movement through the Canadian Arctic Islands. One is the narrow passage between Ellesmere Island and Greenland; another the broad passage of McClure Strait to Lancaster Sound between the most northern group of Islands and the larger islands closer to the mainland; and the last is the series of gulfs and straits along the northern mainland coast.

Arctic waters move eastward and southward through the islands and enter Baffin Bay via Smith and Lancaster Sounds. Another current passes through Fury and Hecla Strait into Foxe Basin, west of Baffin Island. The waters from Baffin Bay flow southward past the east coast of Baffin Island through wide Davis Strait, along the coast of Labrador and into the North Atlantic. A northward moving current from the Gulf Stream (North Atlantic Drift) merges with the current from East Greenland and flows northward along the west coast of Greenland through Davis Strait, finally joining the southward moving Arctic Current in northern Baffin Bay. (15) A great contrast in climate is found on the opposite shores of Davis Strait due to the temperature differences between the cold Arctic Current off Baffin Island and the relatively warmer current touching the west coast of Greenland. This fundamental fact of ocean currents explains a great deal of the past history of settlement and present possibilities of these two areas.

As far as is known, tides are not high in the far northern Arctic Islands. The chief tidal influences have been spent by the time they reach this area. Records have been taken only for short periods at a few stations, but there is a suggestion that there may be a complication because of both eastern and western tidal undulations reaching the Arctic Islands. On the east coast of Baffin Island, in the fiords of Cumberland Sound and Frobisher Bay, the tides reach surprising heights of 20 to 30 feet, owing to the tidal waters being compressed into the narrow inlets. These high tides mean that some shores can only be approached at known times and often prevent unloading of supplies except at times of high water.

Hudson Strait and Hudson Bay.

At Hudson Strait the Arctic current branches westward around Resolution Island and flows along the south coast of Baffin Island. (16) Near the western end of the strait this current meets waters moving southeastward from Foxe Channel, and the combined current then drifts eastward off the north coast of Ungava Peninsula, finally joining the main southerly Labrador Current. It is believed that some of the westerly moving water of Hudson Strait slips around Foxe Peninsula of Baffin Island and enters Foxe Basin, giving a general counter-clockwise circular motion of currents within the Basin. (17)

There is also a counterclockwise current in Hudson Bay. Waters move southward around Southampton Island through Roes Welcome Sound and Fisher Strait and along the west coast of the bay. The current follows the general oval shape of Hudson Bay, flowing northward past the east coast and joining the eastward moving stream in Hudson Strait.

The tides in Hudson Strait have an unusual range, owing to the Atlantic waters being funnelled into the narrower space of the Strait. Tides average 25 feet neaps and 30 feet springs at Ashe Inlet on the northern side of the strait, and range from 20 to 35 feet neaps and springs at various places along the southern coast. A spring maximum of 38 feet has been reported at the mouth of the Koksoak River in Ungava Bay. (16) In some places spring range may be twice, or almost three times the neap range, while the variation in successive spring tides may have a difference of almost eight feet. The tidal range becomes less towards the western end of the strait and in the more open areas adjacent to Hudson Bay. Such tidal ranges offer no serious problems to ocean-going ships with experienced navigators in Hudson Strait, but present a real hazard to small coastal schooners or inexperienced pilots. A knowledge of the intricacies of the tides helps to explain some of the problems of servicing the tiny settlements of this region, where no permanent docks are available, and where ships can often discharge cargo only at high tide, and then only by means of lighters.

In Hudson Bay the tides do not have as great a range as in Hudson Strait. Most of the harbours are open to the sea and thus have no constrictions to increase tidal rises. At Churchill tides average from 12 to 15 feet. This is slightly higher than the other west coast stations and occurs about three hours after corresponding tides at Chesterfield. The tidal undulation progresses in a counter-clockwise movement around Hudson Bay. (16) At Port Harrison the influence is greatly spent so that tides are recorded as being only 3 to 4 feet.

Incomplete records of summer water temperatures in Hudson Strait and Bay indicate that there are both cold and warm currents, and help to verify the movements of ocean currents as outlined above. Surface water temperatures on the north side of Hudson Strait are colder than those on the south, and hover around 32°F during the summer. In Hudson Bay coastal

temperatures slightly above 40°F have been recorded in the surface water, but are lower in the central part of the Bay. Below 150 to 200 feet it is believed that the waters of the Bay are dynamically dead, resulting in a cold, saline body of water, with very little fish food and colder than the freezing point of the body fluids of most commercial fishes. (51)

CLIMATE AND WEATHER

In climatic terms an Arctic area is one where the average mean temperature for the warmest month is not above 50°F . In northern Canada the isotherm delimiting this area is generally slightly north of the tree line. Thus the Eastern Arctic is a treeless area, except for small, stunted willows which grow in sheltered valleys. The general climatic conditions are those of long, cold winters and short, cool summers. (18)

The source area of much of the weather phenomena of the mid-latitude regions of North America and the North Atlantic is in the Canadian Arctic. Meteorology stations scattered throughout the region greatly aid in forecasting the weather which will come to the more southerly and easterly areas within a few days. Since the cyclones which bring varying weather conditions to mid-latitude regions generally move from west to east, the information coming from the Eastern Arctic stations is important in forecasting weather for areas farther east and south. Ten weather stations scattered throughout the region are now contributing this service.

Although the Eastern Arctic stations are of value in weather forecasting, the site of most of the stations is a disadvantage in correlating information concerning the climate of the region. Except for the uniformly low area along the west coast of Hudson Bay, most of the post settlements of the Eastern Arctic are in sheltered places. These protected locations, at the heads of bays, or narrow fiords, at tide water, do not directly give data for the upland areas of the interiors. Climatic lines can not be drawn accurately across a map of the Eastern Arctic, since conditions which refer to the scattered coastal stations do not apply to the upland areas between them. However, the climatic information from each station is valuable in that it refers to areas where people are living, and it is the climate of such sheltered areas which will be the concern of any future settlement plans.

Temperature

Owing to the large amount of water within the Eastern Arctic region, winter temperatures are not as low as in some other areas of the interior of Canada or northern United States. However, the general lack of fuel within the region places a high cost factor upon winter warmth for the white residents. The modifying marine influence delays the coldest period so that February is generally the coldest month at each station. Average winter monthly mean temperature ranges from -20°F to -30°F at the most northern Eastern Arctic posts, and varies from -10°F to -20°F in the Hudson Bay and Strait area. Absolute extremes of about -50°F have

been recorded at most of the posts, with the record low of -60° having been reported at both Pond Inlet and Chesterfield. At most of the stations there is an average of $4\frac{1}{2}$ months in which monthly mean temperatures are below 0°F .

The four months of June - September have average monthly mean temperatures above 32°F in most of the Eastern Arctic. During the short summer season vegetation comes to life in the valleys which contain soil, flowers blossom forth in colourful beauty, and myriads of mosquitoes swarm over the low, wet areas. Average daily summer maximum temperatures are in the cool 50's, but maximums of over 70° have been known at most of the stations. A record high of 84° has been recorded at Chesterfield, on the edge of the Barren Lands, while 81° has been reached at Lake Harbour and Cape Hopes Advance on Hudson Strait. The Eastern Arctic stations have not recorded the same high summer temperatures which are known in the Mackenzie Valley in the western part of the Northwest Territories.

When the factors of a short summer season are combined with a general lack of developed soil, it becomes apparent that agriculture under natural conditions is not possible. The shortness of the growing season is illustrated at Chesterfield, where the longest average frost free period of the Eastern Arctic stations is only 67 days. In addition, variability is a great hazard prohibiting an attempt to grow anything, for at Chesterfield first autumn frosts have occurred as early as August 1st and as late as October 3rd. Autumn frosts usually occur much earlier on the east side of Hudson Bay, where the marine influence of cold Hudson Bay is more dominant, so that Port Harrison has an average of only $4\frac{1}{4}$ frost-free days. Similar conditions are found on Baffin Island where the average last frost occurs in late June and the average first frost comes in mid-August. At the far northern post of Pond Inlet there is an average frost-free period of only 29 days, with freezing temperatures having been recorded in every month.

Precipitation

Precipitation is not heavy in the Eastern Arctic, but because of the low rates of evaporation snowfall remains on the ground throughout the winter. Southeastern Baffin Island receives the greatest amount of precipitation because moist winds blow in from the North Atlantic. In this area approximately 8 inches of rain is evenly distributed throughout the four summer months. Seventy to ninety inches of snow is the usual winter recording, with a maximum falling in the late autumn. The east coast of Hudson Bay has a greater amount of precipitation than the west side owing to higher elevations and prevailing on-shore winds. At the far northern Arctic Islands posts an average of 2 to 4 inches of rain plus 30 to 60 inches of snow has been recorded.

Winds

Prevailing wind directions are difficult to determine for the whole region, because most of the posts are located in sheltered areas

and wind directions are controlled by some topographic influence. Winter winds appear to be predominantly from the north or northeast at the far north stations, and blow generally from the west or northwest in the Hudson Bay and Strait area. Arctic conditions and temperatures are thus extended towards the south by these generally northerly winds. During the summer months the southern half of the region is under the influence of weak cyclones which move eastward across the country and bring a variety of wind directions and no prevailing wind. Wind velocities are generally low during the summer and become stronger in the winter. Gales of several days' duration may occur at any time during the winter months, but are most common in October - December. Paradoxically, calms also occur most frequently in the winter as cold polar air masses settle over the region.

Fog

The prevalence of summer fog is one of the hazards of the coastal regions of the Eastern Arctic. When relatively warm air masses from the land come in contact with the cold Arctic waters of Hudson Bay and the Arctic Islands, condensation occurs, causing fog and low clouds to be frequent. The Meteorology Stations in Hudson Strait have an average of 7 to 12 days in each of the four summer months in which fog is recorded, and as many as 15 to 25 days of fog in any one month. Fogs are less frequent during the winter when temperatures over land and sea are more nearly equal. The many foggy days of the summer present a problem to both water and air transportation in this region.

The climate of the Eastern Arctic thus is combined with the disadvantages of topography and lack of soil to make the region a difficult one for future hopes of exploitation. The climate itself is not as severe as in some other Arctic areas, but the southeasterly direction of movement of weather and ocean currents has extended this Arctic climate farther south into the mainland of Canada. The interplay of these natural factors has thus brought the Arctic as far south as latitude 62° on the west side of Hudson Bay, and to about latitude 57° on the eastern coast of the bay. This is about ten degrees, or 700 miles, south of the Arctic Circle, and about the same latitude as the good farming region of the Peace River of Western Canada. Thus, basic factors of geography have placed a delimiting influence upon hopes for development of this area, which comprises one-fifth of Canada. Suggestions for future progress should be made in the light of our knowledge of these controlling physical factors.

ICE CONDITIONS

Sea Ice.

The direction of movement of drifting ice is the result of the interplay of the forces of ocean currents and winds. Ice floes drift along with the major ocean currents, but deviations from the normal may be caused at any time by changes in prevailing winds. Estimates of the usual times of appearances and direction of movement of the ice masses and bergs is thus possible through consideration of the known facts of Hydrography and Climate. However, since Arctic weather varies

from the normal from year to year just as much as it does in mid-latitude regions, ice conditions of any one season will be influenced by weather conditions of that season. Plans to meet these conditions must necessarily be flexible, with allowances made for adjustments to various possible natural conditions.

In the far northern Arctic Islands ice begins to set along the shores about the end of September. As the weather becomes colder this sea-ice grows outward and if the islands are close together, they are linked by an ice bridge which makes travel easy from one island to another. The larger straits may not become completely frozen over, but they will be choked with drift ice from the sea of moving ice in the Arctic Ocean. The ice floes may freeze together to form a temporary bridge which may break up again in the next storm.

In Baffin Bay and Davis Strait drifting ice from the channels between the Arctic Islands is supplemented by numerous bergs breaking off principally from the glaciers of Greenland and to a much lesser extent from those of the northern Eastern Arctic. These ice-fields begin to spread southward, first in narrow strings of ice, and later in broad floes and masses. By November the pack ice has blocked the entrance to Hudson Strait and is joined by more ice from there, spreading southward along the Labrador Coast. By late December it appears off the coast of Newfoundland. (19) The Baffin Bay pack ice is reported to reach its greatest extent in March and April, with ice moving northward along the southwest coast of Greenland, a "middle pack" moving southward into Davis Strait and the "west ice" following the Labrador current southward along the coast of Baffin Island.

Navigation within Baffin Bay depends upon the season. Sometimes the bay is clear of ice during August and September, and in other years adverse winds may cause ice to block the northern part of the bay throughout the year. Although drifting bergs or ice-floes may be met at any time, it is usually possible to travel off the east coast of Baffin Island in late August and throughout September, thus reaching the most northern Arctic posts. There is then a short period when these areas may be reached by ship with some degree of certainty, but the time is short and any delays may cause failure.

In Hudson Bay and Strait the sea ice builds out from the shore for a distance of five to seven miles on the average, generally starting to freeze towards the end of October. The harbour ice attains a usual thickness of about five feet during the winter, but outside the sheltered places storms may slide the masses over one another until such "rafted" ice may have a thickness of several tens of feet. Recent aerial information shows that the central part of Hudson Bay freezes over during the winter, with possibly an open area between this mass and the shore ice. Although Hudson Strait does not freeze over from shore to shore the centre of the channel is blocked throughout the winter by loose ice which moves east and west with the tidal currents.

In late June the sea ice begins to break up and joins the general drift of the currents towards Hudson Strait and the North Atlantic. During much of July Hudson Strait remains non-navigable as this ice

moves outward. Prevailing winds will influence the time of accessibility of most of the harbours. A westerly wind will tend to clear the ice out of the Strait earlier in the season, and a period of easterly winds will hold it back and block the western end of the strait. Northerly winds will push the ice into the harbours on the southern shore of the strait and delay their opening, and prevailing southerly winds will tend to block the north coast harbours. The route into Hudson Bay is generally free of ice during August, September, and most of October, so that ocean-going vessels may navigate with freedom. Toward the end of October or early November the sea ice again begins to form and the Eastern Arctic is cut off from outside communication by boat for another nine months.

River and Lake Ice

The dates of break-up and freeze-up in the lakes and rivers of the Eastern Arctic are important in understanding further problems of accessibility, especially for ski or pontoon-equipped aeroplanes. The river ice in the District of Keewatin usually breaks up in mid or late June, with southerly rivers generally being free of ice earlier than more northern ones. Floating ice will be found for several weeks after the beginning of break-up.

Size and depth of lakes is a factor affecting the time of break-up, with the smaller lakes clearing first. Most of the lakes are free of ice during the first half of July. However, the large ones may have considerable floating ice long after break-up if their outlets are not large enough to carry away the floes. (20) Drifting ice has been known to remain in some of the lakes into early August before melting. This ice is moved about by winds, so that pontoon-landings by aeroplane are usually possible on the windward side.

The period of open water and pontoon landings in the lakes and rivers decreases to the northward, but the period of solid ice and ski-plane landings increases correspondingly. However, both in the northern and southern parts of the Eastern Arctic aircraft landings on the lakes and rivers must be suspended during the break-up and freeze-up period. Although general dates for times of break-up and freeze-up may be estimated for planning, the exact times in any one season would have to be obtained from observations within the area itself.

NATURAL RESOURCES

The resources of the Eastern Arctic are limited. They are limited both in known quantity and quality, and also in relative accessibility to the more populated parts of Canada. In a region where there is no possibility of agriculture or forestry, and where much of the rock exposed is part of the Precambrian complex which has produced wealth in other areas of Canada, the mineral resources become of importance in estimating the value of the region. (21)

Minerals

One of the most promising areas for mineral development lies along

the coast and inland between Eskimo Point and Chesterfield on the west coast of Hudson Bay. Prospecting has been carried on intermittently here since 1928 and mineralization has been noted at several places. Finds of nickel, copper, platinum, gold, and silver have been reported and preliminary investigations made. (22) Although the area is incompletely mapped geologically it is known that the volcanics and Precambrian sediments have shown mineralization. In the limited investigations made up to the present none of the mineral deposits have proved large enough to encourage a mining industry. Whether wealth which has been found in the similar rocks of the District of Mackenzie will also reward prospecting along the west coast of Hudson Bay remains for the future to show. Although there are problems to overcome, the possibilities appear promising.

Similar mineralization has been noted at several places in Ungava District of northern Quebec. An ancient greenstone belt extending inland from Cape Smith has revealed traces of nickel, copper, and gold, but not in sufficient amount to result in development. (23) The area has been barely explored and is similar to other areas of Precambrian rock that, throughout the Canadian Shield, are considered to constitute favourable ground for prospecting.

An iron formation found in the Belcher Islands, Nastapoka Islands and Richmond Gulf area of the east side of Hudson Bay has been known for several decades. (24) Investigations have been carried on by many geologists and leading steel companies, but it seems that the iron formation does not constitute iron ore under present conditions. Although the percentage of iron is relatively high, the percentage of silica is beyond the present limit for commercial development. Prospecting has been hampered by glacial drift mantling the islands and higher grade deposits may yet be found. Improvements in technology and transportation may some day bring these iron formations into the Canadian market.

Along the south and east coasts of Baffin Island discoveries of mica, graphite, and garnet have been noted. (25) However, most of the known minerals of the area are non-metalliferous, and occur either in small or low-grade deposits. This indented coast is accessible from the Atlantic for several months of the year and although present deposits have been of no value, the fact that mineralization has occurred should point the way to future investigation.

In the Admiralty Inlet area of northern Baffin Island faulted and folded Precambrian sediments have been cut by several dykes, with mineralization occurring along the contacts. Traces of gold, silver, platinum, copper, iron, nickel, and antimony have been found, (11) but no extensive prospecting has yet been carried on. Against the favourable facts of good structure and known mineralization are the problems of long distance from markets, a short and uncertain navigation season, and incomplete knowledge of the area.

In a land devoid of wood and developed water-power, the numerous coal deposits of the Arctic Islands may be of value in the future. A Tertiary lignite at Salmon River has been mined for 20 years and supplies

a good fuel to the post settlement of Pond Inlet. (21) Although the coal has a high heat value, it has the physical property of crumbling very easily, so that attempts to ship it have not been successful. In the Carboniferous rocks of the Parry Islands a high grade lignite or sub-bituminous coal is known to crop out in several places and was utilized by early exploratory expeditions. The value of this fuel to any future outpost or meteorology station, to which transportation will be exceedingly difficult, is obvious. Other coal deposits of the Arctic Islands are generally of low grade, but being in an area where freight is expensive, and fuel a necessity, they may become important.

Most of the western and northern Arctic Islands may be geologically favourable for petroleum. (26) Meagre as our information is we know that they are composed of sedimentary rocks similar in age to the nearby oil producing areas of the Mackenzie River Valley and the north coast of Alaska. Seepages of petroleum, or bituminous seepages, have been reported on northern Melville Island and further exploration may reveal others.

Any prospecting or mining activity which is carried on in the Eastern Arctic faces serious problems. Costs are higher than in other more accessible areas of Canada, while geologic mapping and information is poor. However, incomplete knowledge of the geology of the region indicates the possibility of mineral resources, and mineralization has been noted in several widely-scattered places. Although mining activity has been unsuccessful in locating mineral deposits of present economic value, the area is vast and prospectors have covered only small sections of it. Whether present indications are the limits of the mineral resources, or point the way to possible development is left for future investigations to determine.

Flora

Although the Eastern Arctic is defined as that area north of the tree-line, it is definitely not an area devoid of plant growth. During the short summer season when plants and grasses are flourishing, the Arctic lowlands belie their names of Barren Grounds, or the desolate Arctic. While Arctic regions in general have fewer plant species than other parts of the world, vegetation of various types grows in nearly all of the sheltered valleys where there is some kind of soil. Hundreds of species of plants have been collected and identified by botanists, to fill in some of the gaps in our knowledge of the geographic distribution of plant life. (27)

The tree-line, itself, is not as definite a line on the surface of the earth as it is on a map. It is actually a zone where the weaker species of trees have disappeared but the hardy ones still remain. Northward in this zone factors of wind, rainfall, and soil confine even the hardy types to the sheltered valleys fingering northward from the main mass of forest growth. When these trees become smaller and less numerous, one is beyond the tree-line and into the Arctic.

The amount of vegetative cover varies locally within the Eastern Arctic. The tundra areas have a great variety of plants and grasses, with small willows, sometimes reaching ten feet in height, growing in the more favourable sheltered places. The most extensive regions of tundra vegetation are those of the coastal plain west of Hudson Bay and the lowland of central western Baffin Island. In these areas lichens are the chief economic plant since they form the main food supply of the caribou herds which migrate over the region. On the other hand, many sections have no surface cover, but are simply bare bed rock, or disintegrated rocks and glacial boulders. Such surface is typical of the mountainous areas or the tops of the rocky upland ridges.

The flora of the Eastern Arctic has an economic significance which is important to life within the region. (27) Few plants edible for humans are raised, because limitations of climate and soil virtually prohibit agriculture or gardening. However, all food of animals comes ultimately from plants, either directly assimilated by the larger hoofed mammals and by large and small rodents, or indirectly by all the flesh eating predators which prey on the herbivorous species. Thus, the numbers and distribution of the wild life population, and through them part of the native population, can be directly traced to the distribution of plant life in the Arctic regions.

Wild Life

All wildlife in the Eastern Arctic is of the utmost importance to the natives since there is no other local source of food for man. Experience has shown that there is barely enough game to meet the needs of the local residents and all hunting and trapping is carefully controlled to conserve the food supply for the natives. Hunting for sport is not permitted.

The largest and most important of the land animals is the caribou. (28) Its main range is in the vast tundra areas, sometimes called the Arctic Prairies, on the mainland west of Hudson Bay. It is estimated that about three million caribou roam over this area between Hudson Bay and Great Slave and Great Bear Lakes, migrating north and south with the seasons. Other lesser herds, of unknown number, but estimated roughly as 25,000 head in total, are known to live in the lowlands and interior uplands of the west side of Baffin Island. (29) The number of caribou in Ungava District of northern Quebec has decreased greatly within the present century so that there is no longer a sufficient number for food and clothing for the natives. In the far northern group of islands, where no Eskimo are living at present, Polar caribou, a smaller species, and musk-ox exist on the scanty vegetation to be found.

Caribou are hunted by the natives for both food and clothing. Their skins, when taken during late summer, make the best winter clothing available in the region. About 600 to 800 Eskimo dwelling in the southern Keewatin district live chiefly on caribou, supplemented by catches of fish from the numerous lakes. In Baffin Island and northern Quebec caribou are of secondary importance to the sea mammals, and supply only part of the natives' winter clothing and an occasional change of diet.

Of the other larger land animals the polar bear has some local importance and is killed whenever possible. Its meat is used chiefly for

dog feed, but is eaten by the Eskimo upon occasion, while the fur is of chief importance for bedding and robes. Musk-ox were an almost extinct species and the remaining few hundreds are protected by the Government. Not even Eskimo are allowed to kill them, except in dire necessity. The few hundred head in the Thelon Game Sanctuary and vicinity are the last large groups on the mainland of Canada. (30) Unknown, but probably small numbers of musk-ox roam in the far northern islands, notably northern Devon Island and western Ellesmere Island. There are no reindeer herds within the Eastern Arctic, similar to those established at the mouth of the Mackenzie River in the Western Arctic.

Walrus, seals, and white whales are the most important of the sea mammals which serve as food, and in the case of seals, also as clothing to the resident native population. Walrus are no longer widespread throughout the Canadian Arctic, and are now hunted chiefly off eastern Baffin Island, in Hudson Strait, northern Hudson Bay, and Foxe Basin. (31) They are also known in Lancaster Sound and off the east coast of Devon and Ellesmere Islands. Walrus are usually killed in late summer when they congregate on islands off the coast of the above named areas. They are also hunted in the fall from the young sea ice. At present organized hunts are usually supervised by the R.C.M.P., or Hudson's Bay Company, so that the animals are not slaughtered needlessly. Unless the Eskimo are hungry they usually prefer other meat to that of walrus and use both the hide and meat for dog feed.

Although there is a small, but limited, demand for carved ivory objects made from the tusks of walrus, this handicraft is maintained as a spare-time activity and the Eskimo are discouraged from killing the walrus simply for its tusks. Attempts have been made to tan the hides commercially and to use the tanned hides for polishing metal surfaces, but this has been replaced by substitutes. Practically speaking, walrus as a resource is of chief importance to the native population, and probably would rapidly disappear if hunted commercially.

Seal meat is the staple diet of most of the Eastern Arctic coastal Eskimo. Several species of seal have been seen in Eastern Arctic waters, but the two most numerous types are the small Ringed or Jar Seal and the larger Bearded or square-flipper Seal. (31) Many Eskimo groups subsist almost entirely on the meat and blubber of the Ringed Seal for months at a time. It feeds on plankton and is found along all the coasts and fiords. (32) The dehaired skin of the Ringed Seal is used for waterproof boots and kayak covers, while the haired skin is made into clothing to supplement a frequent scarcity of caribou clothing. The blubber is the chief source of oil for the small Eskimo cooking and heating lamps. Seals formerly were taken by harpooning, but now most of them are shot either in the water or while sunning themselves on the ice near breathing holes. Unfortunately many sink and are lost if shot when the seal is not fat. Seal nets, often placed in the open water where ice has been prevented from forming by tidal action, are used in many districts. Seal skins, and 'white coats' of baby seals, are purchased by the trader for a small sum, but their most important value is for local use by the Eskimo inhabitants.

The Bearded Seal is larger than the Jar Seal, and may weigh as much

as 800 pounds. It is valued by the Eskimo since it provides a large amount of meat and blubber. The heavy hide is used for boot soles, or is cut up into heavy line which is used for dog harness, harpoon lines, or strong lashings of any kind. Square-flippers are less numerous than the Jar Seal and do not travel in large schools, but are usually plentiful enough for local needs.

The Harp or Greenland Seal is occasionally found off the north and east coasts of Baffin Island and in Hudson Strait, but is more common off the coasts of Labrador and Newfoundland. (31) The dangers of the commercial sealing industry are illustrated by the fact that the industry has almost extinguished the Harp Seal from the coast of Greenland, and would certainly deplete the food supply of the Eskimo if it were ever attempted on the other species of seals in the Eastern Arctic.

Seals are necessary to the well-being of the Eskimo population, and although they are at present numerous enough to give an adequate supply of food, at times even the Eskimo go hungry when seals cannot be found. Any attempt to kill greater numbers for commercial exploitation would have a detrimental effect upon the health and numbers of the native population.

The whaling industry of the last century brought the Eskimo population into closer contact with white men, as they assisted the whalers in their hunt. Since the large whales have practically disappeared, the natives are now able to hunt only the small white whale and narwhal in certain local areas. The white whale, about 12 feet in length, is widespread throughout Arctic and sub-Arctic seas. (31) It is usually hunted in bays or fiords which they enter in large schools. It is fairly common in Hudson Bay, Hudson Strait, and along the eastern coasts of Baffin Island. At present the only 'industry' of the Eastern Arctic is the whale oil 'factory' at Pangnirtung, where the oil is rendered down after the annual hunt conducted by the Hudson's Bay Company at the head of Cumberland Sound. Several hundred barrels of whale-oil are exported each year from there. Although the soft white skin makes a good leather it has not been tanned in large amounts commercially. The white whale is shot by the Eskimo whenever possible, but is not hunted as extensively as some of the other mammals. They use its skin and meat for food and the blubber chiefly for oil to supplement their diet of seal.

Narwhal are seen in the waters adjoining northern Baffin Island, and the coastal areas surrounding Baffin Bay, but they have also been noted in early summer in Hudson Strait and Foxe Basin. (31) The flesh and skin of the narwhal is used in the same way as those of the white whale. The long, spirally twisted horn which projects forward from its mouth may measure over eight feet and weigh over fifteen pounds. It has a value as ivory, and is traded by the natives whenever obtained, but the narwhal is seldom hunted purposely.

Fish life in the Eastern Arctic is not extremely varied, with Arctic Char being the most common food fish. Although important to a more complete diet, fish probably play less of a part in the food supply of the Eastern Arctic Eskimo than in that of the natives of the Western Arctic. (33) The Eskimo catch them in the rivers in spring and autumn when the char run up or down

the streams, and fish them through the ice of the interior lakes during the early or late winter. The fish are usually out to sea during the summer. Fish nets are used rather crudely by the natives of Hudson Bay and Strait, and stone dams and spears are still used in northern Baffin Island and in the central Arctic areas. Although fish may appear to be abundant locally, continuous fishing soon decreases their numbers owing to their slow rate of growth in northern waters. The Eskimo recognize this fact by rotating fishing camps from year to year. A few attempts to develop a fishing industry have not been successful. The commercial fish of the Newfoundland and Labrador coasts are not found in quantity in the Eastern Arctic, and it has been noted in a previous section that the large area of Hudson Bay does not contain fish food in quantity. Local intensive fishing soon depletes the resources, so that any fishing industry would be but temporary, and unless closely checked would be to the detriment of the food supply of the area.

The Eastern Arctic is the nesting ground of many species of wild-fowl. Geese and ducks of several types summer in various widespread low, swampy areas. As many as 74 species of birds have been noted in one summer in the Eastern Arctic, the chief types being ptarmigan, loons, cranes, plovers, sandpipers, jaegers, gulls, murres, guillemots, owls, and several species of song birds. Although the Eskimo eat large numbers of ptarmigan, they do not depend to any great extent on bird-life in normal times. (34) They may gather birds' eggs in the spring, and the natives of the Belcher Islands have been known to make clothing from the skins, but in general the bird-life of the Arctic acts chiefly as a reserve food supply in times of stress.

Attempts have been made to start an eiderdown industry, collecting down from the Eider Ducks which nest chiefly along the coasts of southern Baffin Island and Cumberland Sound. The project failed for several reasons, notably the lack of skill among the natives in collecting the down, a lack of personnel to clean it for marketing, and a lack of fuel for drying. It is possible that with training and supervision such an industry might be developed as an off-season activity (mid-June to mid-July) for the Eskimo. With a post-war revival of the tourist trade in the Eastern Arctic, eiderdown may attain local value to the natives, but will have to compete with substitutes in the world market.

The Arctic fox is the chief animal of known economic importance in the Eastern Arctic. The trapping of white foxes, along with the occasional blue or crossed fox, has caused the Eskimo to gradually change from a migratory, hunting people to a race of hunters and trappers, still migratory, but centring their activity around certain trading posts. The fox is of negligible importance as food for the Eskimo, but its fur is desired by the outside world, and traders supply the natives with ammunition, guns, utensils, and supplies in exchange for as many fox furs as they can trap within the open season.

The Arctic fox is a scavenger which lives principally along the coast, eating the remains of sea life after some larger animal has eaten its fill. The fox is also found inland, where its chief prey are lemmings - small rodents which live in northern areas. There is a short period of fluctuation in the scarcity and abundance of foxes, which may be correlated

with similar fluctuations in the numbers of lemming and snowy owls. (35) This cycle usually reaches a peak about every four years, and brings a factor of instability in the economic life of the Eskimo.

From the information gathered by questionnaires it is probable that the fox cycle is more apparent in the Eastern Arctic than in the Western Arctic. Moreover, within the former region it is believed that the cycle varies regionally. (35) It seems possible that the peak years of the fox cycle move eastward from northwestern Hudson Bay to Labrador, with the latter being two or three years later. However, more detailed information is necessary before the exact fox cycle and regional variations can be determined.

Fur Trade

The fur trade of the Eastern Arctic is based primarily on the trapping of white foxes by the Eskimo. A few other fur-bearers such as blue, red, and crossed foxes, bear and weasel or ermine are traded, but they are minor as compared with the numbers and value of the white fox catch. This industry is the chief source of revenue from the area, and the fur resource is the only one which has proved valuable for commercial exploitation. Unfortunately the value of this industry fluctuates with the fox cycle and the market price, so that one cannot assess any annual figure upon the trade. However, during the past ten years the Eastern Arctic has yielded furs ranging in value from \$250,000 to \$700,000 annually. This is virtually the only monetary return which this vast area supplies to the total Canadian economy.

The following table illustrates the numbers of various furs exported from the Northwest Territories of the Eastern Arctic during the past decade:

YEAR	White Fox	Blue	Red	Cross	Weasel	White Bear
1933-34	12,588	93	17		211	100
34-35	27,791	160	19	47	1	22
35-36	33,561	388	248	19	460	69
36-37	11,559	78	415	171	276	61
37-38	16,353	156	472	121	28	90
38-39	32,539	371	515	171	245	149
39-40	24,166	201	462	138	961	60
40-41	19,605	152	602	184	73	192
41-42	25,897	247	792	270	71	133
42-43	30,213	866	843	325	130	98

Conservation of Wild Life

Although the Eastern Arctic appears to be a barren, bleak land, there is a wild life population on the land and in the sea, which has supplied food, clothing, and utensils to the Eskimo population for generations. However, there are changes occurring which are affecting these resources, and the most radical of these changes is the fact that the importation of more efficient weapons has meant that the native is killing

more game than formerly. Unless the Eskimo is educated in the ways of conservation the game resources may no longer be adequate to supply the present numbers of the native population.

With the world continually expanding its horizons, looking for new sources of raw material, it is very probable that there will be attempts at commercial exploitation of the wild life of the region. Since it seems apparent that even the increased hunting efficiency of the natives is killing off larger numbers of game than is good for the total wild life population, it is evident that commercial exploitation would certainly soon deplete the resources. Before any exploitation begins in the Eastern Arctic, careful studies of wild life distribution, numbers, and controlling factors are necessary. Wild life conservation is so vitally concerned with the future welfare of the native population that this knowledge is basic in planning future measures to better the lot of the Eskimo.

HUMAN GEOGRAPHY

The Eastern Arctic has a scattered white population, but contains four-fifths of the Canadian Eskimo population. The geographic limitations of the region have meant that the usual occupations which are possible in other parts of Canada can not be carried on in the Eastern Arctic. Factors of topography, climate, and resources have placed restraints upon development and indicated where people could live and what activity they could pursue. If man wishes to live in the area he must either adapt himself to these bounds, or be familiar with them in order to plan to overcome them. Whatever activity is carried on will be influenced to a greater or lesser degree by the geography of the region and the preceding sections outlining basic facts of the physical geography of the Eastern Arctic have described these controlling and limiting factors. In a region such as the Eastern Arctic, where man and geography are necessarily close together, a knowledge and understanding of these facts is necessary to explain the distribution and activities of the human population.

WHITE POPULATION

The word 'settlement' is misleading when speaking of the clusters of buildings which are designated by the place names on the map of the Eastern Arctic. 'Settlement' usually connotes a picture of homes, perhaps farms, roads or trails - a permanent people spreading our civilization to another remote area of the world. This picture is not true of the Eastern Arctic centres where the white population is largely transitory. The total numbers of whites has been gradually increasing within recent years, being about 150 at present, but the personnel itself is continually changing. People live there for a few years and then return to the 'Outside', to be replaced by others.

Most of the white population centres are formed around a fur-trading post. Many of the 'settlements' are no more than that - being composed of

the store, warehouses, blubber sheds, and house of the post manager and perhaps his wife and assistant. Additional organizations have grown up around other of the centres, as a matter of convenience, or owing to certain locational advantages. There are seven Department of Transport Radio and Meteorological Stations within the Eastern Arctic. The three in Hudson Strait have no trading post or other organization on the site. Government-supported hospitals, with resident doctor's home and day schools, are located at Chesterfield and Pangnirtung. Missions of the Anglican or Roman Catholic churches are found at most of the settlements. With a few exceptions the missionaries have not duplicated each others efforts by both being at the same centre. With the addition of R.C.M.P. detachments which were previously mentioned, the list of organizations stationed in the Eastern Arctic is complete. The white residents of the region are either government officials - i.e., doctors, nurses, policeman, meteorologists, and radio operators; traders, or missionaries. A number of military personnel and construction crews have been in the area temporarily since 1942. A few whites remain for many years and all return to civilization either permanently or for periodic vacations. The Eastern Arctic still remains predominately the home of the Eskimo.

There are thirty post settlements scattered along the coasts of the Eastern Arctic, roughly about 100 to 200 miles from each other. (Only one is located inland or cannot be reached by boat from the Atlantic or Hudson Bay.) They vary in size from a single organization such as trading post, Mission or Meteorology Station, to larger centres which have more than one or all of the groups interested in the Arctic. Examples of the larger settlements are Chesterfield, Fort Chimo, and Pangnirtung, each being the largest centre within its region.

Chesterfield is located on the narrow neck of a low rocky point that constitutes the south side of the entrance to Chesterfield Inlet. The community consists of about 15 buildings, housing personnel of the Hudson's Bay Company, Royal Canadian Mounted Police, Department of Transport, and Roman Catholic Mission and Hospital. The usual white population is from 15 to 25 persons. There are about 200 Eskimo, however, who come into this centre to do their trading. The settlement has a rather poor harbour, being open to storms from Hudson Bay, but in normal summer weather large ships anchor offshore and lighter supplies into the beach.

Fort Chimo, on the Koksoak River, about 25 miles from Ungava Bay, vies with Port Harrison on the east coast of Hudson Bay for the honour of being the largest settlement in northern Quebec. The 16 buildings belonging to the Hudson's Bay Company, combined with those of the Anglican mission and R.C.M.P. detachment, give Fort Chimo the largest number of buildings in the Hudson Strait area. This is almost equal in size to the present total of 21 buildings at Port Harrison, sheltering the Department of Transport Radio and Meteorological Station, the Hudson's Bay Company, the Baffin Trading Company and an Anglican mission. A usual population of about 5 whites at Fort Chimo is only half of that at Port Harrison. About 400 Eskimo come into the former post, and about 400 use Port Harrison as

their trading centre. Both have geographic advantages in being located in the central part of their local region. Fort Chimo, especially, is fortunately located in a lowland area at the head of Ungava Bay near river transportation, and with river terraces above both banks giving a broad level area suitable for expansion.

Pangnirtung is the largest settlement on Baffin Island. It is located on a small sloping terrace at the foot of high and scenic mountains which rise above narrow Pangnirtung fiord, in the northeast part of Cumberland Sound. At 'Pang' there is the government-supported hospital, operated by the Anglican mission, the government doctor's residence, and the R.C.M.P. detachment, in addition to the numerous buildings of the Hudson's Bay Company, including their whale-oil plant. This active community centre has an average population of 15 to 20 persons, including several women nurses at the hospital. With more than 550 Eskimo in the Cumberland Sound area, which is noted for its good sealing and whaling, this is one of the densest areas of Eskimo population.

Life on the whole is both rigorous and comfortable for the white inhabitants of the Eastern Arctic. During the winter when the police, missionaries, and traders visit the Eskimo camps in the area, the hardships of travel by dog sled in cold weather over rough terrain or broken sea ice call for a hardy type of man. However, within the settlement most of the homes are sturdily built and well insulated, and normally life is fairly comfortable. Ample supplies of food are brought in each year and reserves are maintained for emergencies. Although there are fellow whites for companionship at most of the centres, there is a definite feeling of isolation, which is only accentuated when the annual supply ship pulls in for a few days and then departs for another year. However, such isolation appeals to certain personalities and is probably part of the famed 'lure of the North' which calls men back into this Arctic region.

ESKIMO POPULATION

The Eskimo population of the Eastern Arctic is scattered in small families or groups in the southern Arctic Islands, and in the area of mainland Canada north of the tree-line. This climatic and vegetative line thus also forms a cultural boundary, separating Indians and Eskimo. Except for some 700 to 800 Eskimo living in the southern Keewatin District, (36) by hunting caribou and fishing, the Canadian Arctic Eskimo is a coastal dweller. He has adapted himself to the rigours and limitations of a country which produces little, and he obtains most of his food and clothing from the more abundant sea life.

Origin

It is believed that the Eskimo is Mongoloid in origin. His short, stocky stature, creamy skin, hairless face and slant eyes are all typically Mongoloid features. However, contact with white men during the whaling and exploring days of the past few centuries has added other blood to the race. Modern civilization has also brought many changes to the Eskimo, so that the only examples of primitive Eskimo culture will be found in the interior and less accessible areas of Back River, Pelly Bay, and Boothia Peninsula.

Archaeological studies have given many indications of the early origins and movements of the Eskimo people, but many blank periods still remain in the story. (37) On St. Lawrence Island in Bering Sea, recent archaeological investigation has revealed a culture which probably came from Siberia and from there spread to the mainland of Alaska. It is possible that from this parent civilization two cultures split off - the Pumuk culture which is found in the area south of Bering Strait, and the Birnirk culture of the north coast of Alaska. Both cultures pre-date the 7th century A.D.; thus, Mongoloids must have entered North America across Bering Strait before this time, possibly around 200 - 300 A.D. The Birnirk culture is estimated to have flourished around 600 A.D., and from it the Eskimo civilization known as Thule culture evolved and spread along the coast of Alaska. This culture henceforth remained coastal and as far as we know had no further contacts with cultures to the south, while it flourished in the Western Arctic.

The Thule culture began to spread eastward around 700 to 800 A.D. (37) Its movement was, possibly, by boat along the coast, or may have been speeded by the introduction of the dog sled from western Alaska or Siberia. There was no definite migration, but aided by greater mobility, it was a half-aimless drift along an unknown coast seeking only richer hunting grounds. It is probable that the first bands of Eskimo reached the coast of Hudson Bay about 900 A.D. There they found a still older culture which differed from the Thule, and which is known by the name of Dorset. Where the 'Dorset' Eskimo originated, and how they came into the Eastern Arctic is still a mystery, although much of their cultural remains are similar to Indian types. Whether the Eskimo and Indian, who were very antagonistic to each other in past centuries, and to this day do not mix much, have some common ancestor in the Dorset culture remains unknown. The active Thule culture absorbed and assimilated the Dorset people and spread eastward into Baffin Island and along Hudson Strait.

Thule culture became widespread in the region around Hudson Bay, and by 1000 A.D. had reached Greenland. In this latter area the culture evolved gradually into its present form, which is well illustrated around the village of Thule in north western Greenland. However, in the Hudson Bay region there was an abrupt change, probably around the 15th century. It appears that the Thule inhabitants were overwhelmed by invading Eskimo who lacked the former's specialized skill in hunting the larger sea mammals. These invaders must have come from inland, from the so-called Barren Lands west of Hudson Bay. Thus, most of the present Eastern Arctic culture is a fusion of that of the inlanders with the older coastal Thule inhabitants. (37)

Present Population

The present Canadian Eskimo population is listed as 7,392, based on incomplete 1941 census returns. Later figures which did not arrive in

Ottawa until 1943, after the official figures were released, indicate that a figure of 7,700 is probably a fairly accurate minimum estimate of the Eskimo population. (38) Eskimo are spread over an area of about 872,000 square miles north of the tree-line (exclusive of the area of the far northern islands where they do not live at present) giving an approximate density of population of one Eskimo for every 115 square miles. Of the 5,404 Eskimo moving around in the Northwest Territories, 1,582 are in the Western Arctic and the remaining 3,822 are in the Eastern section. When this latter total is combined with the 1,965 living around the coastal areas of Ungava District in northern Quebec, it is shown that about 80 per cent of the Canadian Eskimo population lives in the Eastern Arctic.

The Eskimo of the Eastern Arctic differ from the better-known Eskimo of the Mackenzie Delta and Amundsen Gulf area of the Western Arctic. These latter people have been in closer continuous contact with the white men who have come down the Mackenzie Valley. Many of them are relatively prosperous, wear white men's clothing much of the time, and carry on business successfully with the traders of the area. Some of the Eskimo themselves are full-time traders. Stories and accounts of the Canadian Eskimo population have usually referred to these people of the Western Arctic, who actually comprise only about 20 per cent of the total Eskimo population. The Eastern Arctic Eskimo because of his environment and relative inaccessibility has been less influenced by white men, and the natives of the Central Arctic Islands and interior mainland have been least modified. These regional differences illustrate the fact that no generalization can be made about the Canadian Eskimo population, and when plans are being formulated to better their lot and give them increased service and attention, these differences will have to be considered. (38)

The Eskimo are a migratory race, actually few in number, and spread over a vast area with limited transportation facilities. Since the wild life resources of the region are not concentrated in any one area, neither are the natives. True, they do use one trading post in each local region as their usual centre, and their numbers may be said to be tributary to the area around that post, but within the section they move from camp to camp following their usual hunting and trapping activities. Any plans to consider bringing greater medical attention and a broader education to the Eskimo must take into account these migratory habits and the many camp-sites of the native population.

Eskimo Camp-sites

Eskimo camps are of various types and illustrate the seasonal round of activity of these people. (38) There are some camp-sites which are located in the vicinity of particularly favourable hunting spots and are used throughout the year by the natives. Although some families, or members of a family, may be absent from it for part of the time, there is commonly someone in the vicinity. Most of these usual summer and winter camps are well known to the natives of the area and to the white residents of the nearby trading centre. There are other camps which, although in

sufficiently good hunting areas to be used in both winter and summer, are only used occasionally, or in alternate years.

Winter camps in the Eastern Arctic generally consist of dome-shaped snow houses, which can be constructed out of snow blocks within an hour or so by an expert Eskimo. They are left unoccupied when a family moves out, and a new house is built at the next camping spot. Sometimes several families may be grouped in one area carrying on their winter hunting and trapping. Winter camps are chosen, or shifted, for three chief functions. For part of the year it may be on the shore of an interior lake, where the family will fish for long weary hours with hooks or nets through holes in the thick ice. On the other hand, the camp may be located on the coast, from whence the Eskimo hunters will go out on the sea ice to harpoon or shoot seals through breathing holes, or in the spring, to steal up within shooting range as the seals bask in the sun at the floe edge.

Winter camps are also situated on a trap-line, and from mid-November to the end of March, when the open season for foxes ends, the Eskimo periodically visits his fox traps. The skins will be later brought into the post to be traded for more of the goods and necessaries which white men have brought into his life. The Eskimo's wealth will vary with the fox cycle, and his catch will also depend on how much time he has to spend hunting seals or fishing for food.

Usual summer camps are those which are generally found at the same place for several years in succession but during the summer only. They are quite often located on offshore islands or at the mouths of rivers. If the camp is on an island it is from here that the Eskimo hunter pushes off in his wooden boat or skin kayak to hunt seals or walrus for his summer's food and winter's oil and dog feed. A summer camp at the mouth of a river is located so that the Eskimo may fish there in July when the fish are going out to sea, and again in September, when they are running upstream to the interior lakes. Sometime during the late summer period some of the group will pack their skin tents, carry a supply of food, and go inland to hunt caribou, the skins of which will later be made into winter clothing by the women.

The chief event of the summer is the coming of the annual supply ship. This occurs at approximately the same time each year, and varies from mid-July to late September, according to the position of the settlement on the route of the Eastern Arctic Patrol. About 'Ship-Time' the natives begin to move towards the post from scores of miles along the coast. It is a happy, carefree holiday for them, as they put on their best clothes to greet the white visitors and officials. It means an annual reunion - a chance to visit friends and relatives from other camps and to tell and be told the news of the past year. The Eskimo all help to unload the barges which lighter supplies ashore, and while they are at the post are paid in rations by the trading company. Medical and dental attention is given to all who need it, while the ship is in port, and while the Eskimo are all assembled at one spot for the only time during the year. After the ship leaves the natives again disperse in their family groups to continue their seasonal hunting activities.

Population Trends.

Statistics taken over the past 15 years show that the Canadian Eskimo population is slowly increasing at the rate of about one per cent annually. (38) Their numbers are controlled by the limited resources of their environment. Any increase in numbers will have to come as a result of better game management and conservation, or through a greater importation of white man's food. This latter factor appears to be detrimental to the health of the Eskimo in their present transitional stage. Eskimo birth rates of about 35 per 1,000 are high compared with the rest of Canada, while their infant mortality rates are not as serious as might be expected among a primitive people. However, a fairly high accident rate and various epidemics which strike periodically have been controlling factors in preventing a great increase in population. Any attempts to bring greater medical care and education to these people have been hampered by their migratory habits, so that many of the advantages of our civilization have not yet reached this population.

The population of the Eastern Arctic is small in comparison with other sections of Canada, and scattered over a vast area. The Eskimo population is probably in general equilibrium with the natural environment as a result of years of adjustment to the problems and limitations of a poorly endowed region. If the Eskimo is going to maintain his present activities and habits, there is little hope for any great increase in population. However, if he is going to be trained to fit into and assist the activities of white civilization which is irresistibly moving in upon him, a greater variety of occupations and imported food will lessen the pressure upon the resources of the sea and land. Such advances in civilization, however, must be carefully watched and guided so as to be for the benefit of the native population.

On the other hand, there arises the problem of how much of white civilization is actually going to move into the Eastern Arctic. White man's activities will be in proportion to the limited resources and relative accessibility of the area. Agriculture and forestry are usually the basis for any permanent population. In a region in which normal agriculture or forestry is not possible because of the Arctic climate and lack of soil the country can hardly be said to be self-contained from the white man's standpoint. To say that the region will never be more settled or utilized is to belie progress and expansion. There certainly is space for more meteorology stations, administrative officers, medical facilities, scientific research centres, and mining industries. However, such a population will be supported from the outside - and at an expense - and will be few in total numbers. An understanding of how the problems of the natural environment, described in the preceding sections, affect and limit active white settlement will help one to appreciate the difficulties to be faced in developing and utilizing the Eastern Arctic.

TRANSPORTATIONSummer Transportation

Summer transportation for the population of the Eastern Arctic is almost wholly by water, and, except for air transport, this is the only method of getting into the area during the short summer season. The chief and most dependable means of transportation in the region are the two ice-breakers, R.M.S. "Nascopie" and C.G.S. "N.B. McLean". The former is the

Hudson's Bay Company's annual supply ship and also carries the government officials, doctors, and scientists of the Eastern Arctic Patrol. The Patrol gives the more extensive coverage of the Eastern Arctic posts, normally stopping at about half of them, and is usually the only ship to call at the northern Baffin Island centres. The "N.B. McLean" is the Department of Transport ice-breaker which aids ships in the navigation of the Hudson Bay route. It enters Hudson Strait early in the season and sees that all navigation aids, such as buoys, lights, and direction-finding stations, are working properly. During the season it usually patrols the route, aiding ships with instructions and information concerning ice conditions. The only other large ships in the Eastern Arctic during the summer are the grain and cargo vessels travelling the Hudson Bay Route to Churchill. In the pre-war days these averaged about 10 to 15 in a season.

Several schooners also travel with supplies to the various Eastern Arctic posts not visited by the larger ships. The Hudson's Bay Company has the "Fort Severn" calling at its trading posts along the west coast of Hudson Bay, using Churchill as a base for her several trips. They also use the schooner "Fort Charles" for the east coast of Hudson Bay, with headquarters at Moose Factory on the southern part of James Bay. Another ship brings the Hudson's Bay Company's supplies to the Ungava Bay section, either from Churchill or after trans-shipment from the "Nascopie" at Hebron, Labrador. The Baffin Trading Company charters its own schooner, the "Marion Duffet", which supplies its trading posts at Sugluk, Cape Dorset, and Port Harrison. Prior to the War the Roman Catholic missions were provisioned by their new schooner the MF "Therese", which visited the Hudson Strait and Bay posts and even reached Igloolik in Foxe Basin. In the 1943 season the R.C.M.P. had their sturdy little ship, the "St. Roch", calling at their detachments for inspection and bringing the year's supplies. The "St. Roch" had previously made the first west-to-east trip through the historic Northwest Passage from the Western Arctic, navigating the route in two seasons, after wintering on the west coast of Boothia Peninsula. There are thus several small ships travelling around in the Eastern Arctic and stopping at the post settlements for a few days. Their routes are fairly constant, but their schedules, like all planning in this region, are very elastic, and depend upon the variable seasonal conditions of ice, tides, and weather.

Local transportation may be found at nearly all of the Eastern Arctic centres. This may be by small schooners, such as the "Nanook" of the Hudson's Bay Company, and the "Lake Harbour" of the R.C.M.P., or the "Koksoak" of the H.B.C. at Fort Chimo, or other similar vessels used by the local organization at a post. In addition, there are many native-owned boats called "peterheads" which are found at most of the centres. These peterheads are decked boats, about 40 feet in length, usually powered by a gasoline motor and an auxiliary sail. Partially-decked motor boats, up to 35 feet in length, are also used in some places.

Native boats are of several types, dependent upon the economic status or

habits of the local area. Peterhead boats are owned by the more prosperous Eskimo, and smaller whaleboats, with oars and a sail, are a more common means of family transportation. In addition, there are a variety of small outboards, dories, and canoes, which are used for hunting and travelling. The umiak, or women's boat, used to be the families' means of travelling along the coast, propelled by oars or a rough sail, but it has now disappeared since the arrival of commercial exploitation of the white fox, to be replaced by white mens' manufactured boats and engines. The skin kayak which is distinctively an Eskimo invention, is still used as an effective hunting weapon, chiefly in the Hudson Strait area, but even it is gradually disappearing from several areas. Its manoeuvrability, and almost-silent speed made it very efficient for shooting and harpooning the larger sea mammals in the water. (39)

All of the coastal stations in the Eastern Arctic are visited by boats at some time or other during the summer season. Schedules, and to a lesser extent routes, are controlled by ice conditions and weather, especially at the beginning and end of the navigation season. During the months of August and September very little difficulty is experienced in travelling anywhere by water in the Hudson Bay and Strait area. Problems of weather are chiefly those of prevalent summer fog, with the possibility of storms increasing in the autumn. Transportation facilities are limited simply because the present ships and schooners have been adequate to supply the few centres of the area. Any increased volume of freight or traffic would greatly burden and impede the present facilities, unless more ships were brought into the area. It is not possible for one to pick a spot and say that one wished to go there. It might be that this place is only visited once in a year, and then only for a few days within a certain short period. There has been no need for an elaborate transportation system in the Eastern Arctic, and knowledge of these limitations is necessary before planning any travelling in the area.

Tourist Travel

In a region such as the Eastern Arctic where scenery is so different from the rest of Canada, it is possible that this resource can be exploited in a greater development of the tourist trade. The Eastern Arctic has spectacular ice caps, snow-fields, and long, twisting glaciers in steep-sided, scenic fiords; and for variety it has bleak areas of barren rock or forlorn tundra vegetation. Summer cruises, amid the adventure of ice floes, to visit a different race of people, the Eskimo, may hold a post-war attraction to the North American populace, which will increase the transportation facilities of the region. In plans for the future development of the Eastern Arctic, scenery and the appeal of a remote area are resources which cannot be overlooked.

The Northwest Passage

The historic Northwest Passage has never yet been made by a single ship within one season. The search for this passage in the last two centuries was the means of discovering and charting the coast lines of many of the Arctic Islands, but ice movements always prevented any ship

from travelling all the way through in a single season. In 1937, when the Hudson's Bay Company's "Nascopie" from the east met the Company's small schooner "Aklavik" from the Western Arctic, at the opening of the trading post of Fort Ross on Bellot Strait, goods were exchanged and a route made possible for commerce. (40) However, shallow seas in Queen Maud Gulf probably prohibit any large ships from travelling the western half of this route. The passage through the deeper water of the northern route of Viscount Melville Sound and McClure Strait has always been blocked by ice moving eastward from the Arctic Ocean, whenever viewed or attempted. Lancaster Sound is the main eastern entrance to such a route since Fury and Hecla Strait, joining Foxe Basin and the Gulf of Boothia, has never been navigated, owing to ice blocking the channel whenever boats attempted it. Uncharted and shallow water is also a factor here in limiting the size of vessel. It is probable that the Northwest Passage could be forced by a powerful ice-breaker, or the southern route via Bellot Strait could be made in one season by a fast, reinforced schooner, but other than the historic significance of the feat, there remains the question of how much economic importance this route would have. There may be advantages in a greater local trade between the Eastern and Western Arctic, but as a major world trade route, or a commercial route similar to the Russian Northern Sea Route, the cost is too high, the risk too great, and the resources for trade are too limited at the present time.

Winter Transportation

Winter transportation in the Eastern Arctic is almost entirely by dog-team and sled. This method of travelling in the region has been used by the Eskimos for centuries, and was adopted by the white men as the only logical means of transportation. The "highways" are the miles of sea ice which build out from the coasts during the winters. The ice is sometimes smooth and sometimes rough and hummocky where storms have compressed it into ridges, but on the whole it is the best route of travel. Thus, movement during both summer and winter is chiefly along the coast from one camp to another. Overland travel in winter when the snow finally becomes deep enough for sledging is easier than summer travel across the water-soaked land. Depending on the climate of the local area, snow does not usually collect in sufficient depth for travel until about December. There is thus a period of immobility after the time when the ice begins to form and the boats are beached for the winter. Sledging is fairly simple over the lowland areas, and in the mountainous regions certain passes or lower routes are well-known to the Eskimo and white residents.

The sledges which are used in the Eastern Arctic are long and narrow, usually about 16 to 24 feet in length depending on the region and the type of surface over which they are travelling. Supplies are lashed on to the flat cross-pieces and the sled is usually guided from the front. As much as 1,000 to 2,000 pounds may be carried in this fashion, depending on how many dogs are in the team. The dogs in the Eastern Arctic pull the sledge by what is known as a "fan-hitch", in which they each have separate lines of various lengths attached to the front of the sled. (41) In this way the dogs may each pick their way over rough ice or terrain, and each pulls individually, so that the Eskimo driver with his long whip may watch any lazy dog.

The average team varies in size depending on the prosperity of the native and the number of dogs available in the area, but usually has from 10 to 20. Travelling in this way, with good weather, distances of 30 miles or more can be covered in a day before stopping to build a snow-house for the night.

This method of winter travel is used by police, missionaries, and traders in moving from camp to camp, on patrols or visits. Such patrols help to keep the whites in contact with the Eskimo, and are the chief way of travelling over the interior areas of the Eastern Arctic. An innovation in winter transportation methods has been the attempts to use tractors to haul supplies over the sea ice and frozen ground. (42) This method has been fairly successful in local areas, and could probably be more widely used if the need arose. On the whole, the Eastern Arctic is cut off from the outside world during the winter, but travel and communication is possible and fairly easy in local areas over the frozen snow-covered surface.

All-Season Transportation

There are no railroads or roads within the Eastern Arctic giving all-season transportation. This lack has been simply because there has been no need for either roads or railroads to carry the limited freight and traffic. The tiny trading and administrative centres have been adequately supplied by other, less expensive, methods. Two railroads give access to the edge of the region. The terminal at Churchill has a train coming in from The Pas and Winnipeg twice a week all year. This route had its main importance in pre-war days in carrying grain to the large Churchill elevator, where it was stored pending shipment by ocean-going ships following the short Hudson Bay route to Europe. From Churchill, connections are possible for the Eastern Arctic section west of Hudson Bay by schooner in summer and dog sledge in winter. The other single track railway has its terminal at Moosonee at the southern end of James Bay. Here, shallow water limits shipping to small schooners, but connections are possible for the east coast of Hudson Bay by boat or dog sledge.

Air is the only other possibility for all-season transportation. Flying has been successful in the Eastern Arctic and is probably the best method of making the region more accessible. In an area of so many lakes and rivers, the possibilities for travelling around in a float-equipped plane seem unlimited during the summer. Similarly, ski-planes in the winter find numerous landing places on the thickly-frozen lakes and smooth sea ice of the harbours. However, flying also faces certain problems in the Eastern Arctic. There is a period during break-up and freeze-up when no travel is possible either by water, sea-ice, or air, unless land bases are used. Fog and overcast, which is common in the summer, and is most prevalent in the late spring and early autumn, is the chief obstacle to regular summer flying. Another weather problem which is typical of most sub-Arctic regions of the world where air masses meet is the fact that a belt of bad weather is often found along the transitional zone between Arctic and Temperate conditions. Thus, the chief flying problem arises in entering the region, for within the Arctic itself weather is generally better than in temperate regions which are influenced by cyclonic circulation. (43)

The best season for flying in the Arctic is reported to be late winter and early spring, when there are sufficient hours of sunlight, clear air, and high ceilings. A technological problem must be met in keeping motors warm and being able to start them in low ground temperatures, if shelter is not available. (44) A further climatic problem which hampers winter flying is the short period of daylight in these high latitude regions. In summer the days are long, helping to balance the disadvantages of poorer flying weather. The following table illustrates the number of hours of daylight between sunrise and sunset at various Arctic latitudes at certain seasons. To accurately illustrate the number of hours of actual daylight, as much as two hours of civil twilight, depending upon latitude and season, should be added to these figures.

Latitude	Jan. 1	Feb. 1	Mar. 1	Apr. 1	July 1	Aug. 1	Sept. 1	Oct. 1
60	6 (8)	8 (9 $\frac{1}{2}$)	10 1/3 (12)	14 $\frac{1}{4}$ (11 $\frac{1}{2}$)	18 $\frac{1}{2}$ (22)	17 (19)	11 $\frac{1}{4}$ (15 $\frac{1}{2}$)	11 $\frac{1}{2}$
65	3 2/3	6 $\frac{3}{4}$	10	14 $\frac{1}{2}$	17 $\frac{1}{2}$ (21)	18 $\frac{1}{4}$ (21 $\frac{1}{2}$)	14 $\frac{3}{4}$ (16 $\frac{1}{2}$)	11 1/4
70	0	4 $\frac{3}{4}$	9 $\frac{1}{4}$	14	24	21 $\frac{1}{2}$ (24)	15 $\frac{1}{2}$ (18)	11 $\frac{1}{4}$
75	0	0	8 1/3	14 $\frac{3}{4}$	24	24	17	11

Hours of daylight, including civil twilight are in brackets.

Navigation

Navigation by both air and water is faced with a problem of rapidly changing magnetic variations in the Eastern Arctic because of proximity of the North Magnetic Pole on the west side of Boothia Peninsula. (45) For example, a ship calling at the posts on northern Baffin Island would have a magnetic compass pointing west and south-west, while at Fort Ross the needle would weakly point southward. Not only does the magnetic variation change rapidly, but the horizontal magnetic attraction is weak, and the compass needle tends to dip downward or spin lazily, instead of pointing in the direction of the North Magnetic Pole. In addition, there are several areas of local magnetic disturbances where the compass needle will spin crazily in all directions; some of these areas are known and mapped, but there are probably others which have not been discovered.

Large ships have solved this problem by using an expensive gyro compass which is not affected by magnetic attraction. Similarly, since contact flying is difficult over this region, because of the lack of accurate map information, and the uniform appearance of the lake-dotted areas, the use of a gyro or astro compass is essential for safe flying.

Accessibility by Air

As a means of getting into the Eastern Arctic during all seasons for short visits or emergency calls, for rapid contact, and greater medical and health service, the aeroplane is unequalled. Such service will be more

expensive than the present safe but slow methods, but greater care for the native wards of Canada and better service for her people in pioneer lands, should be worthy of the effort.

The future accessibility and development of the Eastern Arctic is probably closely linked with progress in air transportation. This region lies on the short great circle route between well-populated areas of the central United States, Europe, and western U.S.S.R. A series of air bases are necessary along the route to allow for short hops and emergency landings, but such bases would be located in an area which offers little in the way of local freight. The Eastern Arctic route would thus face competition from the other air routes farther south, with better weather, and greater possibilities of short-hop freight and traffic from the more populated areas of Eastern Canada and United States. Although the possibilities of long-range flying are left for commercial firms to determine, any air bases located in the Eastern Arctic could be of definite value in bringing the Administration of the Northwest Territories into closer all-year contact with the problems of the region.

COMMUNICATION

Communication between the Eastern Arctic and the outside world is not so limited as transportation. Nearly all of the centres (including all Hudson's Bay Company posts) are now equipped with two-way radios with which conversation may be carried on in code and in some places by voice. (46) Most of the trading post stations have an output of 15 watts, which will only reach a few hundred miles into the surrounding area. However, by means of a system of relaying messages and funnelling them through the more powerful Department of Transport stations, all centres are able to communicate with each other and with their headquarters in southern Canada. Of special significance is the way radio communication is used to give medical advice to far-distant posts. Outward symptoms are wired in to the Government doctor's headquarters, and he in turn replies with instructions as to how to use the supplies in the government medical kits which have been placed at each centre. Radio communication in the Eastern Arctic is often not good, being hampered by atmospheric disturbances, but it has proved to be invaluable in bringing closer contact between the widespread people of the area, and their friends and headquarters outside.

Communication by mail has been only as frequent as the present transportation facilities allow. At most of the settlements mail is normally received once a year, when the Eastern Arctic Patrol ship arrives. It then has to be hastily read and answered before the boat finishes unloading the annual supplies. For the centres along the west coast of Hudson Bay an additional pick-up and delivery is usually made by anyone going to Churchill by dog sledge during the winter. All mail for the Eastern Arctic is centralized in Ottawa, c/o The Eastern Arctic Patrol, and if chance airplane flights are made to any of the centres mail is sent to the inhabitants. To these people in an isolated area mail is an important factor and service. The efficient way in which it reaches them, utilizing the best transportation facilities available, and arriving safely despite personnel shifts from one post to another is a credit to the officials in charge.

Future Accessibility

The Eastern Arctic has had a relative inaccessibility. It has been inaccessible not only because natural conditions hindered transportation, but because lack of natural resources gave little reason for anyone wanting to go into the area. The development of this little-known region, like most pioneer areas, is closely linked with problems of transportation. In our global world, where regions and countries are being brought closer and closer to each other, the Eastern Arctic can no longer remain outside the realm of world affairs. It will not always be little-known and far away. Although its population is small, and its known resources unimportant at present, it covers a large area of Canada. Knowledge of the basic facts of its natural and cultural environment is essential to understand the problems and limitations of the region in discussing plans for a greater development of a greater Canada.

MAPS AND MAPPING

The Eastern Arctic is poorly and incompletely mapped. The first charts of the coastlines of the Arctic Islands were usually made from ships, with a sextant by the early exploratory expeditions from Britain. A great deal of geographic information was later added in the middle 19th century during the futile search for the lost expedition of Sir John Franklin. (47) More recent expeditions have also contributed their share of information. As a result all of the coastlines of the numerous Arctic Islands have been mapped to some degree, but data on the interior areas are scanty or lacking. Ground control points have been fixed at all of the major posts, but there are long distances between them which have never been tied-in. (48) Expeditions within the last few decades have travelled much of the time on land, and have been better equipped for surveying. They have filled in many of the blank areas on the map and improved the earlier coastal sketches. (49)

Present maps of the Eastern Arctic are a compilation and adjustment of the early exploratory information, plus the latest material, including scattered aerial photographs. The rapidity and accuracy of modern methods of plotting maps from aerial photographs makes this the only feasible way to map these areas of innumerable lakes and rivers thoroughly. The problems of accessibility of the inland areas are largely solved by flying over the region with an aerial camera during the summer season. Because of the difficulty of distinguishing shore lines from sea-ice and picking out snow-covered lakes and rivers from the surrounding topography, aerial photography is only practical during the long daylight hours of the summer.

GOVERNMENT

Canada's sovereignty has been exerted in the Canadian Arctic regions since the areas were transferred to her by Britain in 1880. (50) Britain had been the leader in doing most of the mapping and exploration. During the period of discovery 1576-1902 there were 49 British expeditions, 13 American, 1 Danish and 1 Norwegian in the area. After taking over active administration of the Canadian Arctic in 1880 Canada, in 1895, divided the

territory into four provisional districts of Ungava, Franklin, Mackenzie, and Yukon. The District of Franklin included all of the territory of the Arctic Islands as far west as longitude 141° west, and northward to the North Pole.

The Canadian government has patrolled the area by sending in frequent expeditions to carry on various kinds of research. At the turn of the century historic ships such as the "Neptune", "Alert", "Diana", and C.G.S. "Arctic" were exploring in the region, mapping geology and topography, watching the whaling activities, and visiting the Eskimo population. In 1922 the Eastern Arctic Patrol was initiated, and since that time Government officials, police inspectors, scientists, and special investigators have annually visited all of the major settlements. (52) In 1933 the Patrol was transferred to the Hudson's Bay Company supply ship "Nascopie", so that more posts could be visited and at a time when most of the natives would be present. The Patrol has thus served the dual purpose of seeing that the Eastern Arctic was being properly administered, and bringing back scientific data about this far-northern region.

Although the Commissioner of the Northwest Territories is responsible for the administration of the Eastern Arctic (exclusive of northern Quebec), local duties are carried out by the R.C.M.P. detachments which are in radio contact with headquarters in Ottawa. Through their extensive winter and summer patrols they keep in close touch with both natives and whites in the vast area. Many of their epic patrols especially those over the far-northern group of islands where no one is living, have been exploratory achievements as great as other elaborate expeditions, but simply have been carried out in the line of duty. (53) The adventures and hardships of the police in actively occupying and investigating this area are not widely known, but they are fully appreciated by the people responsible for the administration.

Scientific Research

Scientific research has always been actively fostered by the Canadian Government in the Eastern Arctic. Not only have scientists been carried on the Eastern Arctic Patrol and left at certain areas to carry on investigations in many and varied fields, but from time to time special investigators have been sent into the area for a full year or more to bring back detailed reports on the country and its inhabitants. However, much remains to be known, and many problems of Arctic phenomena await further research. The Administration's attempts to start Arctic research centres within the area as permanent bases for investigations have been postponed by the war, and the interest of scientific bodies in other wartime matters, but such plans are being evolved for the future.

Social Services

Although under government supervision, the social services, such as religion, education, and health, have been left chiefly in the hands of the two church mission organizations. Since the problems of dealing with a

migratory population are different from those of the Mackenzie District and the Western Arctic, these services have not been as well developed in the Eastern Arctic. Boarding schools at any one centre would reach so few children within the nearby area that the cost of education would be high per native. In addition, when Eskimo children are kept at a school they do not fully learn the hunting, fishing, and trapping methods of their fathers, or how to keep a home on the trail like their mothers, and therefore may have future difficulty in supporting themselves. Education for this widespread, migratory population is not a simple matter. The character of such education will have to depend upon whether the Eskimo is to be trained to fit into our civilization, or to better fit him to live his present mode of life.

At present some missionaries hold day classes whenever natives are present, in which the fundamentals of reading, writing, and hygiene are taught. The Eskimos have mastered a system of syllabic writing (geometric characters similar to a type of shorthand), which most of them can now read and write quite adequately. However, the Eskimo language itself is very intricate and difficult to learn, and since the natives have had very little inclination to speak English, there is a possibility that future administration may some day have trouble in communicating with the natives, unless more Eskimos are taught English, to act as intermediaries.

Medical care and facilities are likewise difficult and expensive to bring to this region of vast areas, few people, and limited transportation. There are two government-supported hospitals at present within the area; the one at Chesterfield is run by the Roman Catholic Mission, while that at Pangnirtung is operated by the Anglican Mission. Both are normally attended by a government doctor, but are admittedly inadequate to give full medical attention to the whole population. The problem of servicing such a large area with only two hospitals has been somewhat alleviated by placing government medical kits at nearly all of the posts and giving first aid instructions by radio from the medical centres and Ottawa. The problems of bringing fuller medical attention to the native population who are undergoing an adjustment to white man's food, and to the resident white population who want service, are closely linked with future developments in transportation facilities.

Problems of Government

The problems of government and administration in the Eastern Arctic have been made complex and difficult by the natural factors of limited resources, population, and transportation. This area is not like any other part of Canada and each problem has had to be handled separately in the light of what is known about the region. Much of the actual responsibility for immediate action has necessarily been given to persons within the area, with the Administration in Ottawa being familiar with the activities which were going on, and in the final analysis deciding policy and supervising local authority. For sixty-four years the Canadian government has been actively exploring this area, investigating its resource possibilities, looking after the native population, and combatting the many problems of a

forbidding country. The fact that the area is still but sparsely settled and little developed is not due to lack of trying, but is an example of the controlling influence of a harsh natural environment. The region has offered few possibilities of, and many obstacles to, development, and little attraction to a white population. The results of the efforts of government and administration have been influenced by these factors.

SUMMARY

The Eastern Arctic of Canada is a vast arctic section of the north-eastern mainland and islands, covering one-fifth of Canada. In it are found four-fifths of the Canadian Eskimo population and a few hundred non-permanent white residents. The last Ice Age left much of the area as a barren, bleak, and in some places, still ice-covered, region; while the rigors of our modern climate are responsible for general lack of tree growth and soil development. The distribution of land masses and ocean currents have been influential in extending this arctic area farther south into Canada than might be expected in latitudes elsewhere. Ice movements shorten the navigation season and hamper transportation. Geologically, much of the area is within the Precambrian complex which holds prospects for mineral development, but its other natural resources, chiefly wildlife of the land and sea, have only been adequate to support a small total of migratory Eskimo inhabitants.

Geography is the science of organizing and correlating facts about the natural environment and its influence upon the inhabitants. Its function in the present outline of the Eastern Arctic is to bring this information together and show how these various factors have influenced the past and will be influential in the future development plans for the region. Its purpose is to present facts and show their inter-relation, in order that the reader may have more than a superficial understanding of the area. Its aim is to give a feeling for the problems of the region and its people, insofar as such problems are due to or influenced by the natural environment, and through this understanding to make possible planning for future development and expansion.

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The following bibliography is a list of references for more complete information on some of the subjects outlined in the preceding text. It lists only the chief references which were used in the preparation of this manuscript and is not a complete bibliography on the Eastern Arctic.

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